

What is claimed is:

1           1. A reduced size microstrip antenna for use on a  
2 projectile comprising:  
3           a dielectric substrate positioned on said projectile;  
4           an antenna element mounted on said dielectric substrate,  
5                said antenna element receiving a L-Band radio  
6                frequency signal from an external source, said  
7                antenna element having a shape approximating a  
8                square;  
9           an annular slot centrally located within said antenna  
10                element, said annular slot being positioned and  
11                dimensioned to reduce a size for said antenna element  
12                by approximately two percent when compared to a solid  
13                copper antenna element operating at an identical  
14                frequency and bandwidth as said reduced size  
15                microstrip antenna; and  
16           a pair of angled slots located in opposed corner of said  
17                antenna element, said pair of angled slots providing  
18                for a circular polarization for said reduced size  
19                antenna element.

1           2. The microstrip antenna of claim 1 wherein said antenna  
2 element has four edges with equal lengths of 2.130 inches.

1           3. The microstrip antenna of claim 1 wherein said annular  
2 slot within said antenna element has a diameter of 0.3750  
3 inches and is positioned 1.0650 inches from each of four edges  
4 of said antenna element.

1           4. The microstrip antenna of claim 1 wherein said pair of  
2 angled slots are angled at forty five degrees and have a length  
3 of 0.202 inches.

1           5. The microstrip antenna of claim 1 further comprising a  
2 copper transmission line connected to said antenna element,  
3 said copper transmission line being a signal output for said  
4 antenna element, said copper transmission line having a  
5 characteristic impedance of 100 ohms.

1           6. The microstrip antenna of claim 1 wherein said antenna  
2 element comprises a copper antenna element.

1           7. The microstrip antenna of claim 1 wherein said L-Band  
2 radio frequency signal is centered at a frequency 1.575 GHz  
3 with a bandwidth of  $\pm 10$  MHz.

1           8. The microstrip antenna of claim 1 wherein said  
2       dielectric substrate has a thickness 0.050 inches and is  
3       fabricated from a laminate material.

1           9. The microstrip antenna of claim 1 wherein the antenna  
2       element of said microstrip antenna is adapted to receive GPS  
3       data contained within said L-Band radio frequency signal.

1           10. A reduced size microstrip antenna for use on a  
2       projectile comprising:

3           a dielectric substrate positioned on said projectile;  
4           an antenna element mounted on said dielectric substrate,  
5                said antenna element receiving a L-Band radio  
6                frequency signal from an external source, said  
7                antenna element having a shape approximating a square  
8                and four edges, each of said four edges having a  
9                length of 2.130 inches;

10          an annular slot centrally located within said antenna  
11          element, said annular slot being positioned and  
12          dimensioned to reduce a size for said antenna element  
13          by approximately two percent when compared to a solid  
14          copper antenna element operating at an identical

15 frequency and bandwidth as said reduced size  
16 microstrip antenna, said annular slot within said  
17 antenna element having a diameter of 0.3750 inches,  
18 said annular slot being positioned 1.0650 inches from  
19 each of the four edges of said antenna element; and  
20 a pair of angled slots located in opposed corner of said  
21 antenna element, said pair of angled slots providing  
22 for a circular polarization for said reduced size  
23 antenna element.

1 11. The microstrip antenna of claim 10 wherein said pair  
2 of angled slots are angled at forty five degrees and have a  
3 length of 0.202 inches.

1 12. The microstrip antenna of claim 10 further comprising  
2 a copper transmission line connected to said antenna element,  
3 said copper transmission line being a signal output for said  
4 antenna element, said copper transmission line having a  
5 characteristic impedance of 100 ohms.

1 13. The microstrip antenna of claim 10 wherein said  
2 antenna element comprises a copper antenna element.

1           14. The microstrip antenna of claim 10 wherein said L-Band  
2 radio frequency signal is centered at a frequency 1.575 GHz  
3 with a bandwidth of  $\pm 10$  MHz.

1           15. The microstrip antenna of claim 10 wherein said  
2 dielectric substrate has a thickness 0.050 inches and is  
3 fabricated from a laminate material.

1           16. The microstrip antenna of claim 10 wherein the antenna  
2 element of said microstrip antenna is adapted to receive GPS  
3 data contained within said L-Band radio frequency signal.

1           17. A reduced size microstrip antenna for use on a  
2 projectile comprising:

3           a dielectric substrate positioned on said projectile;  
4           an antenna element mounted on said dielectric substrate,  
5           said antenna element receiving a L-Band radio  
6           frequency signal from an external source, said  
7           antenna element having a shape approximating a square  
8           and four edges, each of said four edges having a  
9           length of 2.130 inches, said antenna element being  
10          fabricated from copper;  
11          an annular slot centrally located within said antenna

12 element, said annular slot being positioned and  
13 dimensioned to reduce a size for said antenna element  
14 by approximately two percent when compared to a solid  
15 copper antenna element operating at an identical  
16 frequency and bandwidth as said reduced size  
17 microstrip antenna, said annular slot within said  
18 antenna element having a diameter of 0.3750 inches,  
19 said annular slot being positioned 1.0650 inches from  
20 each of the four edges of said antenna element;  
21 a pair of angled slots located in opposed corner of said  
22 antenna element, said pair of angled slots providing  
23 for a circular polarization for said reduced size  
24 antenna element, wherein said pair of angled slots  
25 are angled at forty five degrees and have a length of  
26 0.202 inches; and  
27 a copper transmission line connected to said antenna  
28 element, said copper transmission line being a signal  
29 output for said antenna element, said copper  
30 transmission line having a characteristic impedance  
31 of 100 ohms.

1 18. The microstrip antenna of claim 17 wherein said L-  
2 Band radio frequency signal is centered at a frequency 1.575

3 GHz with a bandwidth of  $\pm 10$  MHz.

1           19. The microstrip antenna of claim 17 wherein said  
2 dielectric substrate has a thickness 0.050 inches and is  
3 fabricated from a laminate material.

1           20. The microstrip antenna of claim 17 wherein the  
2 antenna element of said microstrip antenna is adapted to  
3 receive GPS data contained within said L-Band radio frequency  
4 signal.